



10-07-03

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANTS: Michael Z. Hu

DOCKET NO.: 1066.0

SERIAL NO.: 10/623,395

ART UNIT:

FILED: July 18, 2003

EXAMINER:

TITLE: Method for Making Fine and Ultrafine Spherical Particles of Zirconium Titanate and Other Mixed Metal Oxide Systems

INFORMATION DISCLOSURE STATEMENT under 37 CFR 1.56 and 1.97

Assistant Commissioner for Patents
Washington, D. C. 20231

Sir:

Submitted herewith on Forms PTO/SB/08A and PTO/SB/08B is a listing of documents known to applicant in order to comply with applicant's duty of disclosure pursuant to 37 C.F.R. 1.56. A copy of each document is being submitted herewith to comply with the provisions of 37 C.F.R. 1.97 and 1.98.

Applicant presents these references that the Patent Office may determine any relevancy thereof to the presently claimed invention.

Applicant respectfully requests that the references be expressly considered during the prosecution of the subject application and made of record therein and appear among the "references cited" on any patent to issue therefrom.

Applicant also requests that an initialed copy of Forms PTO/SB/08A and PTO/SB/08B be returned in accordance with MPEP Section 609.

Respectfully submitted,

Shelley L. Stafford

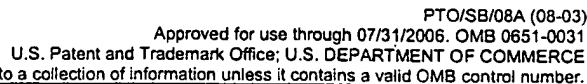
Shelley L. Stafford, *Agent for Applicants*
Reg. No. 38,623
UT-Battelle, LLC
P.O. Box 2008 MS 6498
Oak Ridge, TN 37831
(865) 576-7561

Certificate of Mailing

I hereby certify that this correspondence is being deposited with the U.S. Postal Service as EXPRESS MAIL in an envelope addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450 on

October 6, 2003

Shelley L. Stafford



(Use as many sheets as necessary)

Sheet	1
-------	---

of 6

Application Number	10/623,395
--------------------	------------

Filing Date	7-18-2003
-------------	-----------

First Named Inventor	Hu, Michael Z.
----------------------	----------------

Art Unit

Examiner Name _____

Attorney Docket Number	1066.0
------------------------	--------

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use as many sheets as necessary)		Complete if Known	
		Applicant Number	10/623,395
		Filing Date	7-18-2003
		First Named Inventor	Hu, Michael Z.
		Art Unit	
		Examiner Name	
Sheet 2	of 6	Attorney Docket Number	1066.0

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. ¹	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T ²
	4	MAHANDRIMANANA, A. et al., "Nonhydrolytic Sol-Gel Process: Aluminum and Zirconium Titanate Gels," 1997, p. 89-93, 8	
	5	MAHANDRIMANANA, A. et al., "Non-hydrolytic Sol-Gel Process: Zirconium Titanate Gels," J. Mater. Chem., 1997, pp.279-284, 7(2)	
	6	AZOUGH, F. et al., "The Relationship Between the Microstructure and Microwave...", J. Mater. Sci., 1996, p. 2539-2549, 31	
	7	BATEMAN, C. et al., "CAD Representation of the Systems ZrO ₂ -MgO-TiO ₂ and...", Physica B, 1988, p. 122-128, 150	
	8	BIANCO, A. et al., "Zirconium Titanate: from Polymeric Precursors to Bulk Ceramics," J. Eur. Cer. Soc., 1998, p. 1235-1243, 18	
	9	BIANCO, A. et al., "Zirconium Titanate Microwave Dielectrics Prepared via Polymeric Precursor Route," J. Eur. Cer. Soc., 1999, p. 959-963, 19	
	10	BHATTACHARYA, A. et al., "Low-temperature Synthesis and Characterisation of Crystalline Zirconium Titanate Powder," Mat. Lett. 1994, p. 247-250, 18	
	11	BHATTACHARYA, A. et al., "Inorganic Sol Gel Synthesis of Zirconium Titanate Fibres," J. Mater. Sci., 1996, p. 5583-5586, 31	
	12	BHATTACHARYA, A. et al., "Sol Gel Preparation, Structure and Thermal Stability...", J. Mater. Sci., 1996, p. 267-271, 31	
	13	BONHOMME-COURY, L. et al., "Preparation of Al ₂ TiO ₅ -ZrO ₂ Mixed Powders via Sol-Gel Process, J. Sol Gel Sci. & Technol., 1994, p. 371-375, 2	

Examiner Signature		Date Considered	
--------------------	--	-----------------	--

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ Applicant's unique citation designation number (optional). ² Applicant is to place a check mark here if English language Translation is attached.

This collection of information is required by 37 CFR 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.



Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use as many sheets as necessary)		Complete if Known			
		Applicant Number	10/623,395		
		Filing Date	7-18-2003		
		First Named Inventor	Hu, Michael Z.		
		Art Unit			
		Examiner Name			
Sheet	3	of	6	Attorney Docket Number	1066.0

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. ¹	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T ²
	14	CHEN, D. et al., "Hydrothermal Synthesis and Characterization of Crystalline ZrxTi1-xO4...", J. Mater. Sci. 1999, 1379-1383, 34	
	15	CERQUEIRA, M. et al., "Synthesis and Characterization of PLZT (9/65/35) by the Pechini Method and Partial Oxalate," Mater. Lett., 1998, 166-171, 35	
	16	CERQUEIRA, M. et al., "Synthesis of Ultra-fine Crystalline ZrxTi1-xO4 Powder by Polymeric Precursor Method," Mater. Lett., 1995, 181-185, 22	
	17	ELLIS, S. et al., "Powder Synthesis Research at CAMP," Cer. Bull., 1989. 988-994, 68	
	18	HIRANO, S. et al., "Chemical Processsing and Microwave Characteristics...", J. Am. Ceram. Soc., 1991, 1320-24, 74	
	19	HU, M. et al., "Sol-Gel and Ultrafine Particle Formation via Dielectric Tuning of Inorganic Salt...", J. Colloid Inter. Sci., 2000, 20-36, 222	
	20	HU, M. et al., "Wet-chemical Synthesis of Monodispersed Barium Titanate Particles...", J. Powder Technol., 2000, 2-14, 110	
	21	HU, M. et al., "Homogeneous (co)precipitation of Inorganic Salts for Synthesis...", J. Mater. Sci., 2000, 2927-2936, 35	
	22	IKAWA, H. et al., "X-ray Photoelectron Spectroscopy Study of High and Low-Temperature Forms...", J. Am. Ceram. Soc., 1991, 1459-62, 74	
	23	IKAWA, H. et al., "Phase Transformation and Thermal Expansion...", J. Am. Ceram. Soc., 1988, 120-27, 71 (2)	

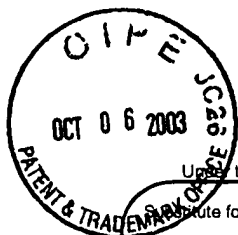
Examiner Signature		Date Considered	
--------------------	--	-----------------	--

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ Applicant's unique citation designation number (optional). ² Applicant is to place a check mark here if English language Translation is attached.

This collection of information is required by 37 CFR 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.



PTO/SB/088 (08-03)

Approved for use through 07/31/2006. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Use the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**

(Use as many sheets as necessary)

Complete if Known

Application Number	10/623,395
Filing Date	7-18-2003
First Named Inventor	Hu, Michael Z.
Art Unit	
Examiner Name	
Attorney Docket Number	1066.0

Sheet	4	of	6
-------	---	----	---

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No. ¹	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T ²
	24	ISOBE, T. et al., "Mechanochemical Synthesis of ZrTiO ₄ Precursor From Inhomogeneous Mixed Gels," Mater. Res. Soc. Symp. Proc., 1994, 273-77, 346	
	25	KARAKCHIEV, L. et al., "Low-Temperature Synthesis of Zirconium Titanate," Inorg. Mater., 2001, 386-390, 37	
	26	KHAIRULLA, F. et al., "Chemical Synthesis and Structural Evolution of Zirconium Titanate, Mater. Sci. Eng., 1992, 327-336, B12	
	27	KOMARNENI, S. et al., "Sol-Gel Processing of Some Electroceramic Powders," J. Sol-Gel Sci. Technol., 1999, 263-270, 15	
	28	KREBS, M. et al., "A Raman Spectral Characterization of Various Crystalline Mixtures...", J. Mater. Sci. Lett., 1988, 1327-1330, 7	
	29	LEITE, E. et al., "Particle Growth During Calcination of Polycation Oxides Synthesized by the Polymeric Precursors Method," J. Am. Ceram. Soc. 1997, 2649-57, 80	
	30	LEONI, M. et al., "Aqueous Synthesis and Sintering of Zirconium Titanate Powders for Microwave Components," J. Eur. Ceram. Soc., 2001, 1739-41, 21	
	31	LESSING, P., "Mixed-Cation Oxide Powders via Polymeric Precursors," Ceram. Bull., 1989, 1002-06, 68(5)	
	32	MACIAS, L. et al., "Kinetic Study of Crystallization in Zirconium Titanate from an Amorphous Reactive Prepared Precursor," J. Non-Crys. Solids, 1992, 262-65, 147&148	
	33	McHALE, A. et al., "Low-Temperature Phase Relationships in the System ZrO ₂ -TiO ₂ , J. Am. Ceram. Soc., 1986, 827-32, 69	

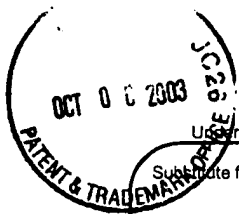
Examiner Signature		Date Considered	
--------------------	--	-----------------	--

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ Applicant's unique citation designation number (optional). ² Applicant is to place a check mark here if English language Translation is attached.

This collection of information is required by 37 CFR 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.



INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use as many sheets as necessary)		Complete if Known	
		Application Number	10/623,395
		Filing Date	7-18-2003
		First Named Inventor	Hu, Michael Z.
		Art Unit	
		Examiner Name	
Sheet 5	of 6	Attorney Docket Number	1066.0

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. ¹	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T ²
	34	MONTANARO, L. et al., "Preparation of Microspheres from an Alumina-Zirconia Sol," Ceram. Bull., 1989, 1017-20, 68(5)	
	35	MOON, Y. et al., "Preparation of Monodisperse ZrO ₂ by the Microwave Heating of Zirconyl Chloride Solutions," J. Am. Ceram. Soc., 1995, 1103-1106, 78	
	36	NAVIO, J. et al., "Heterogeneous Photocatalytic Oxidation...", New Developments in Selective Oxidation II, 1994, 721-721, 82	
	37	NAVIO, J. et al., "Photocatalysed Oxidation...", Heterogeneous Catalysis and Fine Chemicals III, 1993, 431-437, 78	
	38	NAVIO, J. et al., "Formation of Zirconium Titanate Powder from a Sol-Gel Prepared Reactive Precursor," J. Mater. Sci., 1992a, 2463-2467, 27	
	39	NAVIO, J. et al., "On the Influence of Chemical Processing in the Crystallization...", J. Mater. Sci. Lett., 1992, 1570-1572, 11	
	40	NAVIO, J. et al., "Thermal Evolution of (Zr,Ti)O ₂ Gels Synthesized at Different Basic pH," J. Therm. Anal., 1993, 1095-1102, 40	
	41	PARK, H. et al., "Effect of Solvent on Titania Particle Formation and Morphology in Thermal Hydrolysis of TiCl ₄ ," J. Am. Ceram. Soc., 1997, 743-49, 80(3)	
	42	SANCHEZ, P. et al., "Thermal Evolution of TiO ₂ -ZrO ₂ Composites Prepared by Chemical Coating Processing," Mater. Lett., 1994, 339-344, 20	
	43	SEKAR, M. et al., "Hydrazine Carboxylate Precursors to Fine Particle...", Mat. Res. Bull., 1993, 485-492, 28	

Examiner Signature		Date Considered	
--------------------	--	-----------------	--

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.
1 Applicant's unique citation designation number (optional). 2 Applicant is to place a check mark here if English language Translation is attached.
This collection of information is required by 37 CFR 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO:
Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.



PTO/SB/08B (08-03)

Approved for use through 07/31/2006. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use as many sheets as necessary)		Complete if Known	
		Application Number	10/623,395
		Filing Date	7-18-2003
		First Named Inventor	Hu, Michael Z.
		Art Unit	
		Examiner Name	
Sheet 6	of 6	Attorney Docket Number	1066.0

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. ¹	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T ²
	44	SHAM, E. et al., "Zirconium Titanate from Sol-Gel Synthesis: Thermal Decomposition and Quantitative Phase Analysis," J. Solid State Chem., 1998, 225-32, 139	
	45	STUBICAR, M. et al., "Synthesis of ZrTiO ₄ Powder from Equimolar ZrO ₂ Powder Mixture by High Energy...", Metalurgija, 1999, 59-62, 38(2)	
	46	SYAMAL, A., "Hydrazine Carboxylate Precursors to Fine Particle Titania, Zirconia, and Zirconium Titanate," Mater. Res. Bull., 1994, 1001-1003, 29(9)	
	47	XU, J. et al., "X-ray Diffraction and X-ray Absorption Spectroscopy...", Chem. Mater., 2000, 3347-3355, 12	
	48	YAMAGUCHI, O. et al., "Formation of Zirconia Titanate Solid from Alkoxides," J. Am. Ceram. Soc., 1989, 1065-66, 72(6)	
	49	ZHANG, S. et al., "Effect of Composition on Sinterability...", J. Mater. Sci. Lett., 2001-1409-1411, 20	
	50	BIANCO, A. et al., "Zirconium Tin Titanate Thin Films via Aqueous Polymeric Precursor Route," Mater. Sci. & Eng. C, 2001, 211-213, 15	
	51	RENGAKUJI, S. et al., "Preparation and Hydrocarbon Sensing Properties of Ti-Zr-O Thin Films," Electrochemistry (Technical Paper), 2001	
	52	STUBICAR, M. et al., "Microstructure Evolution of an Equimolar Powder Mixture of ZrO ₂ -TiO ₂ ...", J. Alloys and Compounds, 2001, 316-320, 316	
	53	HU, M., High-Tech. Alert, 1998, 1, 15(2)	

Examiner Signature		Date Considered	
--------------------	--	-----------------	--

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ Applicant's unique citation designation number (optional). ² Applicant is to place a check mark here if English language Translation is attached.

This collection of information is required by 37 CFR 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.